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Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	7
1 Scope	8
2 References	8
3 Definitions and abbreviations.....	9
3.1 Definitions	9
3.2 Abbreviations	9
4 Overview	9
4.1 Introduction	9
5 Services offered by the SMF	10
5.1 Introduction	10
5.2 Nsmf_PDUSession Service	10
5.2.1 Service Description.....	10
5.2.2 Service Operations	11
5.2.2.1 Introduction.....	11
5.2.2.2 Create SM Context service operation.....	11
5.2.2.2.1 General	11
5.2.2.2.2 EPS to 5GS Idle mode mobility using N26 interface	13
5.2.2.2.3 EPS to 5GS Handover Preparation using N26 interface.....	15
5.2.2.3 Update SM Context service operation.....	16
5.2.2.3.1 General	16
5.2.2.3.2 Activation and Deactivation of the User Plane connection of a PDU session.....	17
5.2.2.3.2.1 General.....	17
5.2.2.3.2.2 Activation of User Plane connectivity of a PDU session.....	18
5.2.2.3.2.3 Deactivation of User Plane connectivity of a PDU session	19
5.2.2.3.2.4 Changing the access type of a PDU session from non-3GPP access to 3GPP access during a Service Request procedure.....	20
5.2.2.3.3 Xn Handover	20
5.2.2.3.4 N2 Handover	22
5.2.2.3.4.1 General.....	22
5.2.2.3.4.2 N2 Handover Preparation	22
5.2.2.3.4.3 N2 Handover Execution.....	24
5.2.2.3.4.4 N2 Handover Cancellation.....	25
5.2.2.3.5 Handover between 3GPP and untrusted non-3GPP access procedures	26
5.2.2.3.5.1 General.....	26
5.2.2.3.5.2 Handover of a PDU session without AMF change or with target AMF in same PLMN	26
5.2.2.3.6 Inter-AMF change or mobility	26
5.2.2.3.7 RAN Initiated QoS Flow Mobility	27
5.2.2.3.8 EPS to 5GS Handover using N26 interface	28
5.2.2.3.8.1 General.....	28
5.2.2.3.8.2 EPS to 5GS Handover Preparation	28
5.2.2.3.8.3 EPS to 5GS Handover Execution.....	28
5.2.2.3.8.4 EPS to 5GS Handover Cancellation.....	29
5.2.2.3.9 5GS to EPS Handover using N26 interface.....	29
5.2.2.3.10 P-CSCF Restoration Procedure via AMF.....	29
5.2.2.3.11 AMF requested PDU Session Release due to duplicated PDU Session Id.....	29
5.2.2.3.12 AMF requested PDU Session Release due to slice not available	30
5.2.2.4 Release SM Context service operation.....	30
5.2.2.4.1 General	30
5.2.2.5 Notify SM Context Status service operation.....	31
5.2.2.5.1 General	31

5.2.2.6	Retrieve SM Context service operation.....	32
5.2.2.6.1	General	32
5.2.2.7	Create service operation	33
5.2.2.7.1	General	33
5.2.2.7.2	EPS to 5GS Idle mode mobility	35
5.2.2.7.3	EPS to 5GS Handover Preparation	36
5.2.2.8	Update service operation	37
5.2.2.8.1	General	37
5.2.2.8.2	Update service operation towards H-SMF.....	37
5.2.2.8.2.1	General.....	37
5.2.2.8.2.2	UE or visited network requested PDU session modification	38
5.2.2.8.2.3	UE requested PDU session release	38
5.2.2.8.2.4	EPS to 5GS Handover Execution.....	38
5.2.2.8.2.5	Handover between 3GPP and untrusted non-3GPP access (Home Routed PDU session).....	39
5.2.2.8.2.6	P-CSCF Restoration Procedure via AMF (Home Routed PDU session).....	39
5.2.2.8.3	Update service operation towards V-SMF.....	39
5.2.2.8.3.1	General.....	39
5.2.2.8.3.2	Home network requested PDU session modification.....	40
5.2.2.8.3.3	Home network requested PDU session release	41
5.2.2.8.3.4	Handover between 3GPP and untrusted non-3GPP access, from 5GC-N3IWF to EPS or from 5GS to EPC/ePDG	41
5.2.2.8.3.5	EPS Bearer ID assignment.....	42
5.2.2.9	Release service operation	42
5.2.2.9.1	General	42
5.2.2.10	Notify Status service operation	43
5.2.2.10.1	General	43
5.2.3	General procedures	44
5.2.3.1	Transfer of NAS SM information between UE and H-SMF for Home Routed PDU sessions	44
5.2.3.1.1	General	44
5.2.3.1.2	V-SMF Behaviour	44
5.2.3.1.3	H-SMF Behaviour	45
6	API Definitions	45
6.1	Nsmf_PDUSession Service API.....	45
6.1.1	API URI.....	45
6.1.2	Usage of HTTP	45
6.1.2.1	General	45
6.1.2.2	HTTP standard headers	45
6.1.2.2.1	General	45
6.1.2.2.2	Content type	46
6.1.2.3	HTTP custom headers	46
6.1.2.3.1	General	46
6.1.2.4	HTTP multipart messages	46
6.1.2.5	HTTP/2 request retries	47
6.1.3	Resources.....	47
6.1.3.1	Overview.....	47
6.1.3.2	Resource: SM contexts collection	49
6.1.3.2.1	Description	49
6.1.3.2.2	Resource Definition.....	49
6.1.3.2.3	Resource Standard Methods	49
6.1.3.2.3.1	POST.....	49
6.1.3.2.4	Resource Custom Operations	51
6.1.3.3	Resource: Individual SM context.....	52
6.1.3.3.1	Description	52
6.1.3.3.2	Resource Definition.....	52
6.1.3.3.3	Resource Standard Methods	52
6.1.3.3.4	Resource Custom Operations	52
6.1.3.3.4.1	Overview.....	52
6.1.3.3.4.2	Operation: modify.....	52
6.1.3.3.4.2.1	Description	52
6.1.3.3.4.2.2	Operation Definition	52
6.1.3.3.4.3	Operation: release	53

6.1.3.3.4.3.1	Description	53
6.1.3.3.4.3.2	Operation Definition	53
6.1.3.3.4.4	Operation: retrieve	54
6.1.3.3.4.4.1	Description	54
6.1.3.3.4.4.2	Operation Definition	54
6.1.3.5	Resource: PDU sessions collection (H-SMF)	54
6.1.3.5.1	Description	54
6.1.3.5.2	Resource Definition	54
6.1.3.5.3	Resource Standard Methods	55
6.1.3.5.3.1	POST	55
6.1.3.5.4	Resource Custom Operations	57
6.1.3.5.4.1	Overview	57
6.1.3.6	Resource: Individual PDU session (H-SMF)	57
6.1.3.6.1	Description	57
6.1.3.6.2	Resource Definition	57
6.1.3.6.3	Resource Standard Methods	57
6.1.3.6.4	Resource Custom Operations	57
6.1.3.6.4.1	Overview	57
6.1.3.6.4.2	Operation: modify	57
6.1.3.6.4.2.1	Description	57
6.1.3.6.4.2.2	Operation Definition	57
6.1.3.6.4.3	Operation: release	58
6.1.3.6.4.3.1	Description	58
6.1.3.6.4.3.2	Operation Definition	58
6.1.3.7	Resource: Individual PDU session (V-SMF)	59
6.1.3.7.1	Description	59
6.1.3.7.2	Resource Definition	59
6.1.3.7.3	Resource Standard Methods	59
6.1.3.7.3.1	POST	59
6.1.3.7.4	Resource Custom Operations	60
6.1.3.7.4.1	Overview	60
6.1.3.7.4.2	Operation: modify	60
6.1.3.7.4.2.1	Description	60
6.1.3.7.4.2.2	Operation Definition	60
6.1.4	Custom Operations without associated resources	61
6.1.5	Notifications	61
6.1.5.1	General	61
6.1.5.2	SM Context Status Notification	62
6.1.5.2.1	Description	62
6.1.5.2.2	Notification Definition	62
6.1.6	Data Model	62
6.1.6.1	General	62
6.1.6.2	Structured data types	64
6.1.6.2.1	Introduction	64
6.1.6.2.2	Type: SmContextCreateData	65
6.1.6.2.3	Type: SMContextCreatedData	69
6.1.6.2.4	Type: SMContextUpdateData	70
6.1.6.2.5	Type: SMContextUpdatedData	75
6.1.6.2.6	Type: SMContextReleaseData	76
6.1.6.2.7	Type: SMContextRetrieveData	77
6.1.6.2.8	Type: SMContextStatusNotification	77
6.1.6.2.9	Type: PduSessionCreateData	78
6.1.6.2.10	Type: PduSessionCreatedData	82
6.1.6.2.11	Type: HsmfUpdateData	85
6.1.6.2.12	Type: HsmfUpdatedData	89
6.1.6.2.13	Type: ReleaseData	89
6.1.6.2.14	Type: HsmfUpdateError	90
6.1.6.2.15	Type: VsmfUpdateData	91
6.1.6.2.16	Type: VsmfUpdatedData	94
6.1.6.2.17	Type: StatusNotification	95
6.1.6.2.18	Type: QosFlowItem	95
6.1.6.2.19	Type: QosFlowSetupItem	95

6.1.6.2.20	Type: QosFlowAddModifyRequestItem	96
6.1.6.2.21	Type: QosFlowReleaseRequestItem	96
6.1.6.2.22	Type: QosFlowProfile	97
6.1.6.2.23	Type: GbrQosFlowInformation	97
6.1.6.2.24	Type: QosFlowNotifyItem	98
6.1.6.2.25	Type: Void	98
6.1.6.2.26	Type: Void	98
6.1.6.2.27	Type: SMContextRetrievedData	98
6.1.6.2.28	Type: TunnelInfo	98
6.1.6.2.29	Type: StatusInfo	98
6.1.6.2.30	Type: VsmfUpdateError	99
6.1.6.2.31	Type: EpsPdnCnxInfo	99
6.1.6.2.32	Type: EpsBearerInfo	100
6.1.6.2.33	Type: PduSessionNotifyItem	100
6.1.6.2.34	Type: EbiArpMapping	100
6.1.6.2.35	Type: SmContextCreateError	100
6.1.6.2.36	Type: SMContextUpdateError	101
6.1.6.2.37	Type: PduSessionCreateError	102
6.1.6.2.38	Type: MmeCapabilities	102
6.1.6.2.39	Type: Void	102
6.1.6.3	Simple data types and enumerations	102
6.1.6.3.1	Introduction	102
6.1.6.3.2	Simple data types	103
6.1.6.3.3	Enumeration: UpCnxState	103
6.1.6.3.4	Enumeration: HoState	104
6.1.6.3.5	Enumeration: RequestType	104
6.1.6.3.6	Enumeration: RequestIndication	104
6.1.6.3.7	Enumeration: NotificationCause	104
6.1.6.3.8	Enumeration: Cause	105
6.1.6.3.9	Enumeration: ResourceStatus	105
6.1.6.3.10	Enumeration: DnnSelectionMode	105
6.1.6.3.11	Enumeration: EpsInterworkingIndication	106
6.1.6.3.12	Enumeration: N2SmInfoType	106
6.1.6.3.13	Enumeration: MaxIntegrityProtectedDataRate	106
6.1.6.4	Binary data	107
6.1.6.4.1	Introduction	107
6.1.6.4.2	N1 SM Message	107
6.1.6.4.3	N2 SM Information	107
6.1.6.4.4	n1SmInfoFromUe, n1SmInfoToUe, unknownN1SmInfo	108
6.1.7	Error Handling	110
6.1.7.1	General	110
6.1.7.2	Protocol Errors	110
6.1.7.3	Application Errors	110
6.1.8	Feature Negotiation	113
6.1.9	Security	114
Annex A (normative):	OpenAPI specification	115
A.1	General	115
A.2	Nsmf_PDUSESSION API	115
Annex B (Informative):	HTTP Multipart Messages	146
B.1	Example of HTTP multipart message	146
B.1.1	General	146
B.1.2	Example HTTP multipart message with N1 SM Message binary data	147
Annex C (informative):	Change history	148
History		151

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1 Scope

The present document specifies the stage 3 protocol and data model for the Nsmf Service Based Interface. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the SMF other than the Session Management Event Exposure service.

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [4] and 3GPP TS 29.501 [5].

The Session Management Event Exposure Service is specified in 3GPP TS 29.508 [6].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

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- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".
- [3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".
- [4] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".
- [5] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".
- [6] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".
- [7] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".
- [8] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".
- [9] 3GPP TS 38.413: "NG Radio Access Network (NG-RAN); NG Application Protocol (NGAP)".
- [10] IETF RFC 2387: "The MIME Multipart/Related Content-type".
- [11] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".
- [12] IETF RFC 2045: "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies".
- [13] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".
- [14] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".
- [15] OpenAPI Initiative, "OpenAPI 3.0.0 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>.
- [16] 3GPP TS 29.274: "3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".
- [17] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

- [18] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".
- [19] 3GPP TS 29.510: "Network Function Repository Services; Stage 3".
- [20] 3GPP TS 29.518: "5G System; Access and Mobility Management Service; Stage 3".
- [21] 3GPP TS 23.380: "IMS Restoration Procedures".
- [22] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".
- [23] IETF RFC 7807: "Problem Details for HTTP APIs".
- [24] 3GPP TS 23.527: "5G System; Restoration Procedures".
- [25] 3GPP TS 32.255: "Charging management; 5G data connectivity domain charging; stage 2".
- [26] 3GPP TS 32.291: "Charging management; 5G system, charging service; Stage 3".
- [27] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".
- [28] 3GPP TR 21.900: "Technical Specification Group working methods".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

DNN	Data Network Name
HR	Home Routed
JSON	Javascript Object Notation
LADN	Local Area Data Network
SM	Session Management
SMF	Session Management Function

4 Overview

4.1 Introduction

Within the 5GC, the SMF offers services to the AMF, other SMF (V-SMF or H-SMF), PCF and NEF via the Nsmf service based interface (see 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3]).

Figure 4.1-1 provides the reference model (in service based interface representation and in reference point representation), with focus on the SMF and the scope of the present specification.

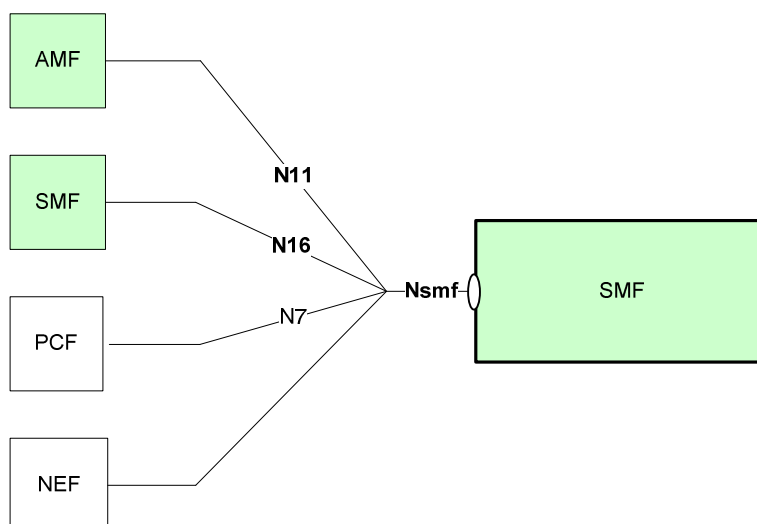


Figure 4.1-1: Reference model – SMF

The functionalities supported by the SMF are listed in clause 6.2.2 of 3GPP TS 23.501 [2].

5 Services offered by the SMF

5.1 Introduction

The SMF supports the following services.

Table 5.1-1: NF Services provided by SMF

Service Name	Description	Example Consumer
Nsmf_PDUSession	This service manages the PDU sessions and uses the policy and charging rules received from the PCF. The service operations exposed by this NF service allows the consumer NFs to establish, modify and delete the PDU sessions.	V-SMF, H-SMF, AMF
Nsmf_EventExposure	This service exposes the events happening on the PDU sessions to the consumer NFs.	PCF, NEF, AMF

The Nsmf_EventExposure service is specified in 3GPP TS 29.508 [6].

5.2 Nsmf_PDUSession Service

5.2.1 Service Description

The Nsmf_PDUSession service operates on the PDU Sessions. The service operations exposed by this service allow other NFs to establish, modify and release the PDU Sessions. The following are the key functionalities of this NF service:

- Creation, modification and deletion of SM contexts for PDU Sessions upon receiving N1 message notification from AMF carrying the NAS SM messages; an SM context represents an association between the NF Service Consumer (e.g. AMF) and the SMF for a PDU session;
- Retrieval of SM contexts of PDU sessions, e.g. to move PDU sessions towards the EPC using the N26 interface;
- Creation, modification and deletion of PDU sessions between the V-SMF and H-SMF, in HR roaming scenarios;

- Association of policy and charging rules with PDU Sessions and binding the policy and charging rules to flows;
- Interacting with the UPF over N4 for creating, modifying and releasing user plane sessions;
- Process user plane events from the UPF and apply the corresponding policy and charging rules.

The Nsmf_PDUSession service supports the following service operations.

Table 5.2.1-1: Service operations supported by the Nsmf_PDUSession service

Service Operations	Description	Operation Semantics	Example Consumer(s)
Create SM Context	Create an SM context in SMF, or in V-SMF in HR roaming scenarios, for a PDU session.	Request/Response	AMF
Update SM Context	Update the SM context of a PDU session and/or provide the SMF with N1 or N2 SM information received from the UE or from the AN.	Request/Response	AMF
Release SM Context	Release the SM context of a PDU session when the PDU session has been released.	Request/Response	AMF
Notify SM Context Status (see NOTE 1)	Notify the NF Service Consumer about the status of an SM Context of a PDU session (e.g. the SM Context is released within the SMF).	Subscribe/Notify	AMF
Retrieve SM Context (see NOTE 2)	Retrieve an SM context of a PDU session from SMF, or from V-SMF in HR roaming scenarios, for 5GS to EPS mobility.	Request/Response	AMF
Create	Create a PDU session in the H-SMF, in HR roaming scenarios.	Request/Response	V-SMF
Update	Update a PDU session in the H-SMF or V-SMF, in HR roaming scenarios.	Request/Response	V-SMF, H-SMF
Release	Release a PDU session in the H-SMF, in HR roaming scenarios.	Request/Response	V-SMF
Notify Status (see NOTE 3)	Notify the NF Service Consumer about the status of a PDU session (e.g. the PDU session is released due to local reasons within the H-SMF).	Subscribe/Notify	V-SMF
NOTE 1: This corresponds to the SMContextStatusNotify service operation defined in 3GPP TS 23.502 [3].			
NOTE 2: This corresponds to the ContextRequest service operation defined in 3GPP TS 23.502 [3].			
NOTE 3: This corresponds to the StatusNotify service operation defined in 3GPP TS 23.502 [3].			

5.2.2 Service Operations

5.2.2.1 Introduction

See Table 5.2.1-1 for an overview of the service operations supported by the Nsmf_PDUSession service.

5.2.2.2 Create SM Context service operation

5.2.2.2.1 General

The Create SM Context service operation shall be used to create an individual SM context, for a given PDU session, in the SMF, or in the V-SMF for HR roaming scenarios.

It is used in the following procedures:

- UE requested PDU Session Establishment (see clause 4.3.2 of 3GPP TS 23.502 [3]);
- EPS to 5GS Idle mode mobility or handover using N26 interface (see clause 4.11.1 of 3GPP TS 23.502 [3]);
- EPS to 5GS mobility without N26 interface (see clause 4.11.2.3 3GPP TS 23.502 [3]);

- Handover of a PDU session between 3GPP access and non-3GPP access, when the target AMF does not know the SMF resource identifier of the SM context used by the source AMF, e.g. when the target AMF is not in the PLMN of the N3IWF (see clause 4.9.2.3.2 of 3GPP TS 23.502 [3]), or when the UE is roaming and the selected N3IWF is in the HPLMN (see clause 4.9.2.4.2 of 3GPP TS 23.502 [3]);
- Handover from EPS to 5GC-N3IWF (see clause 4.11.3.1 of 3GPP TS 23.502 [3]);
- Handover from EPC/ePDG to 5GS (see clause 4.11.4.1 of 3GPP TS 23.502 [3]).

There shall be only one individual SM context per PDU session.

The NF Service Consumer (e.g. AMF) shall create an SM context by using the HTTP POST method as shown in Figure 5.2.2.2.1-1.

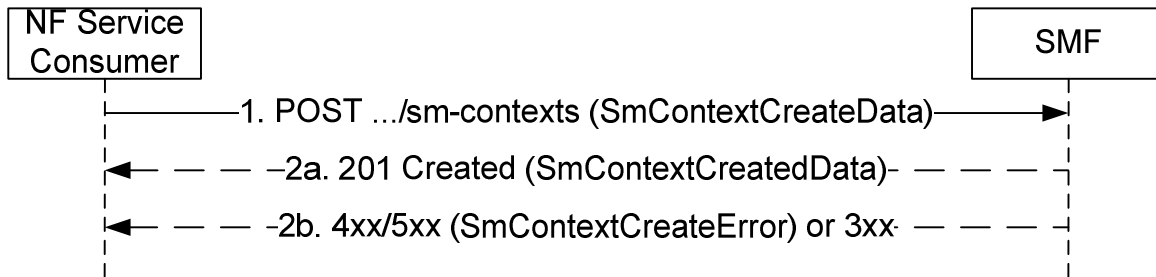


Figure 5.2.2.2.1-1: SM context creation

- The NF Service Consumer shall send a POST request to the resource representing the SM contexts collection resource of the SMF. The payload body of the POST request shall contain:
 - a representation of the individual SM context resource to be created;
 - the Request Type IE, if it is received from the UE and if the request refers to an existing PDU session or an existing Emergency PDU session, the Request Type IE may be included otherwise;
 - the Old PDU Session ID, if it is received from the UE (i.e. for a PDU session establishment for the SSC mode 3 operation);
 - the indication that the UE is inside or outside of the LADN (Local Area Data Network) service area, if the DNN corresponds to a LADN;
 - a subscription for SM context status notification;
 - the servingNfId identifying the serving AMF;
 - trace control and configuration parameters, if trace is to be activated (see 3GPP TS 32.422 [22]).

For the UE requested PDU Session Establishment procedure in home routed roaming scenario (see clause 4.3.2.2.2 of 3GPP TS 23.502 [3]), the NF Service Consumer shall provide the URI of the Nsmf_PDUSESSION service of the H-SMF in the hSmfUri IE and may provide the URI of the Nsmf_PDUSESSION service of additional H-SMFs. The V-SMF shall try to create the PDU session using the hSmfUri IE. If due to communication failure on the N16 interface the V-SMF does not receive any response from the H-SMF, then:

- depending on operator policy, the V-SMF may try reaching the hSmfUri via an alternate path; or
- if additional H-SMF URI is provided, the V-SMF may try to create the PDU session on one of the additional H-SMF(s) provided.

The payload body of the POST request may further contain:

- the name of the AMF service to which SM context status notification are to be sent (see clause 6.5.2.2 of 3GPP TS 29.500 [4]), encoded in the serviceName attribute.

- On success, "201 Created" shall be returned, the payload body of the POST response shall contain the representation describing the status of the request and the "Location" header shall be present and shall contain the URI of the created resource. The authority and/or deployment-specific string of the apiRoot of the created